

REMARKS

The Office Action of December 2, 2008 has been reviewed and the Examiner's comments carefully considered. The present Amendment modifies claims 1, 14, 15, and 17 and adds new claims 21 and 22, all in accordance with the originally-filed specification. Support for these amendments can be found, for example, in Examples 1-6 and Tables 1 and 3, page 13, lines 5-7 and page 24, lines 3-5 of the originally-filed application. Accordingly, no new matter has been added. Claims 1, 2, and 4-22 are pending in this application, and claims 1, 14, 15, 17, 21, and 22 are in independent form.

Initially, Applicants would like to thank the Examiner for discussing this case with the undersigned on February 9, 2009 (and providing the subsequent Interview Summary, dated February 11, 2009). In this Summary, the Examiner states the following:

Discussed the newly cited Nishumura reference with respect to the teaching of an untwisted fiber. Applicant disagreed with the Examiner that Nishumura teaches the use of an untwisted fiber in the production of a speaker diaphragm as claimed. The Examiner suggested adding language to the independent claims to further define the untwisted fiber with regard to its acoustic effect and other advantages. The Examiner will reconsider upon response from Applicant.

Therefore, and in accordance with the Examiner's suggestions, previous independent claims 1, 14, 15, and 17 have been amended (and new independent claims 21 and 22 added) to include additional features related to the unique aspects of the claimed diaphragm that lead to certain beneficial acoustic effects.

With respect to the present Office Action, all of pending claims 1, 2, and 4-20 stand rejected. Claims 1, 2, 4, 6-8, 14 and 20 stand rejected under 35 U.S.C. § 103(a) as being obvious over the previously-cited Ward patent in view of the previously-cited Mizone patent and the newly-cited Japanese Application No. 08337666 A to Nishimura (hereinafter "the Nishimura reference"). Claim 5 stands rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent, the Nishimura reference and the

previously-cited Inoue and Ogura patents. Further, claims 9-12 and 15-17 stand rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent, and the Nishimura reference, in further view of the previously-cited Kanada publication. Claim 13 stands rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent, and the Nishimura reference, in further view of the previously-cited Thomas patent. Finally, claims 18 and 19 stand rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent, the Nishimura reference, and the Kanada publication, in further view of the previously-cited Yamaji patent. In view of the foregoing amendments and the following remarks, Applicants respectfully request reconsideration of these rejections.

Summary of the Preferred Embodiments

According to the present invention, and as set forth in independent claim 1, as amended, provided is a loudspeaker diaphragm including a base layer having a woven fabric of a plurality of polyethylene naphthalate fibers and impregnated with a thermosetting resin. Each of the plurality of polyethylene naphthalate fibers is an untwisted fiber. Further, the loudspeaker diaphragm exhibits an internal loss of 0.40 or more.

In another embodiment, and as set forth in independent claim 14, as amended, provided is a loudspeaker including a loudspeaker diaphragm having a base layer that has a woven fabric of a plurality of polyethylene naphthalate fibers and impregnated with a thermosetting resin. Each of the plurality of polyethylene naphthalate fibers is an untwisted fiber. In addition, the loudspeaker diaphragm exhibits an internal loss of 0.40 or more.

In a further embodiment of the present invention, provided is a method for manufacturing a loudspeaker diaphragm. This method includes: impregnating a woven fabric of a plurality of polyethylene naphthalate fibers with a thermosetting resin and curing the thermosetting resin, so as to form a base layer; adding inactive gas in a supercritical state to a

molten thermoplastic resin and extruding the mixture of the thermoplastic resin and the inactive gas at prescribed temperature and pressure, so as to form a thermoplastic resin layer; and laminating the base layer and the thermoplastic resin layer. Each of the plurality of polyethylene naphthalate fibers is an untwisted fiber, and the loudspeaker diaphragm exhibits an internal loss of 0.40 or more.

In a still further embodiment, and as set forth in independent claim 17, as amended, the present invention is directed to a loudspeaker diaphragm including a base layer as the outermost layer, a thermoplastic resin layer and a thermoplastic elastomer layer. The base layer has a woven fabric of a plurality of polyethylene naphthalate fibers and impregnated with a thermosetting resin, and each of the plurality of polyethylene naphthalate fibers is an untwisted fiber. Further, the loudspeaker diaphragm exhibits an internal loss of 0.40 or more.

As set forth in another embodiment in new independent claim 21, the present invention is also directed to a loudspeaker diaphragm including a base layer having a woven fabric of a plurality of polyethylene naphthalate fibers and impregnated with a thermosetting resin, where each of the plurality of polyethylene naphthalate fibers is an untwisted fiber. In this claimed embodiment, the fineness of the polyethylene naphthalate fibers is from 800 to 1,200 denier.

In yet another embodiment, and as set forth in new independent claim 22, provided is a loudspeaker diaphragm including a base layer having a woven fabric of a plurality of polyethylene naphthalate fibers and impregnated with a thermosetting resin. Each of the plurality of polyethylene naphthalate fibers is an untwisted fiber, and a laminated structure having a woven fabric layer and a resin layer is substantially formed in the base layer.

The Cited Prior Art

All of the Ward, Mizone, Inoue, Ogura, Thomas, and Yamaji patents, and the Kanada publication, have been discussed throughout prosecution of this application. In the present Office Action, the Examiner cites the Nishimura reference, which is directed to a pre-form and its production. In summary, the Nishimura reference is directed to a deeply-drawn molded article, which is produced by depositing a thermoplastic polymer linearly on warps or wefts of a two-directional fabric of reinforcing fibers. It appears that the Examiner refers to the Nishimura reference for its mention of the use of an untwisted fibrous material in producing the described items.

The Cited Prior Art Does Not Teach or Suggest a
Loudspeaker Diaphragm Set Forth in Independent Claims 1, 14, 15, 17, 21, and 22

First, Applicants specifically incorporate herein by reference all of the arguments and comments made in the previously-filed responses and amendments provided to the Examiner throughout the prosecution of this application. Further, and again, Applicants would like to thank the Examiner for the courtesies extended to the undersigned in the above-referenced interview. In accordance with this interview and the Examiner's indications, independent claims 1, 14, 15, and 17 have been amended, and claims 21 and 22 added, and all of these claims now include certain novel and inventive features not taught or suggested in the prior art, whether used alone or in combination.

All of independent claims 1, 14, 15, and 17 have been amended to specifically recite that the loudspeaker diaphragm exhibits an internal loss of 0.40 or more. Accordingly, this beneficial acoustic effect results from the formation process and material used in manufacturing the loudspeaker diaphragm. None of the Ward, Mizone, Inoue, Ogura, Thomas, and Yamaji patents, the Kanada publication, and the Nishimura reference, teach or suggest, in combination, a loudspeaker diaphragm including a base layer having a woven

fabric of a plurality of polyethylene naphthalate fibers (each being an untwisted fiber) and impregnated with a thermosetting resin, where the resulting internal loss is 0.40 or more.

Further, new independent claim 21 specifically sets forth that the fineness of the polyethylene naphthalate fibers is from 800 to 1,200 denier. None of the Ward, Mizone, Inoue, Ogura, Thomas, and Yamaji patents, the Kanada publication, and the Nishimura reference, teach or suggest, in combination, a loudspeaker diaphragm including a base layer having a woven fabric of a plurality of polyethylene naphthalate fibers (each being an untwisted fiber) and impregnated with a thermosetting resin, where the fineness of the polyethylene naphthalate fibers is from 800 to 1,200 denier.

Finally, new independent claim 22 includes a laminated structure having a woven fabric layer and a resin layer substantially formed in the base layer, which further lead to certain acoustic benefits in the resultant loudspeaker diaphragm. None of the Ward, Mizone, Inoue, Ogura, Thomas, and Yamaji patents, and the Kanada publication, and the Nishimura reference, teach or suggest, in combination, a loudspeaker diaphragm including a base layer having a woven fabric of a plurality of polyethylene naphthalate fibers (each being an untwisted fiber) and impregnated with a thermosetting resin, where a laminated structure having a woven fabric layer and a resin layer is substantially formed in the base layer.

Summary

For the foregoing reasons, independent claim 1 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 1 is respectfully requested. Claims 2, 4-13 and 20 depend either directly or indirectly from and add further limitations to

independent claim 1 and are believed to be allowable for at least the reasons discussed hereinabove in connection with independent claim 1. Therefore, for these reasons, reconsideration of these rejections of claims 2, 4-13 and 20 is respectfully requested.

For the above reasons discussed hereinabove, independent claim 14 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 14 is respectfully requested.

For the foregoing reasons, independent claim 15 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 15 is respectfully requested. Claim 16 depends directly from and adds further limitations to independent claim 15 and is believed to be allowable for at least the reasons discussed hereinabove in connection with independent claim 15. Therefore, for these reasons, reconsideration of the rejection of claim 16 is respectfully requested.

For these reasons discussed hereinabove, independent claim 17 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 17 is respectfully requested. Claims 18 and 19 depend either directly or indirectly from and add further limitations to independent claim 17 and are believed to be allowable for at least the reasons discussed hereinabove in connection with independent claim 17. Therefore, for these reasons, reconsideration of the

rejections of claims 18 and 19 is respectfully requested.

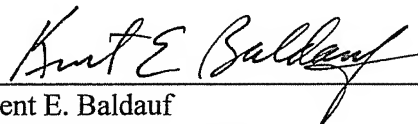
For the above reasons discussed hereinabove, new independent claim 21 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Allowance of independent claim 21 is respectfully requested.

For the foregoing reasons discussed hereinabove, new independent claim 22 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Allowance of independent claim 22 is respectfully requested.

For all the foregoing reasons, Applicants believe that claims 1, 2 and 4-22, as amended and added, are patentable over the cited prior art and in condition for allowance. Reconsideration of the rejections and allowance of all pending claims 1, 2 and 4-22 are respectfully requested. If the Examiner would like to discuss these amended (and added) claims or has any further questions or concerns regarding their allowability, he is invited to contact the undersigned at his convenience.

Respectfully submitted,

THE WEBB LAW FIRM

By 

Kent E. Baldauf
Registration No. 25,826
Attorney for Applicants
436 Seventh Avenue
700 Koppers Building
Pittsburgh, PA 15219
Telephone: (412) 471-8815
Facsimile: (412) 471-4094
E-mail: webblaw@webblaw.com